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UNSOLVED PROBLEMS.

NOTE. The following problems still remain unsolved (in our columns):

Average and Probability, 167. Proposed by R. D. CARMICHAEL, Hartselle, Ala.

A line l is divided into n segments by $n-1$ points taken at random on it; find the mean value of the product of p of the segments, the p segments being taken at random and p being less than n .

Geometry, 246. Proposed by T. L. CROYES, Paris, France.

Given a movable point O on a fixed diameter of a circle S , an inscribed triangle ABC , and the perpendiculars OM , ON , OP from the point O on the sides AB , AC , BC . Prove, by pure geometry, that the circle circumscribing the triangle MNP will always pass through a fixed point.

Group Theory, 8. Proposed by L. E. DICKSON, Ph. D., The University of Chicago.

In a chess tournament between eight players, there are seven rounds, the eight players being paired in each round, every pair to be matched once and but once in the tournament. List the possible programs different except as to notation, *i. e.*, not transformable into each other by a substitution on eight letters. Give the number of conjugate programs of each representative retained.

Mechanics, 181. Proposed by F. ANDEREGG, Professor of Mathematics, Oberlin College, Oberlin, Ohio.

A triangle AOB , of which the sides, OA , AB , and the angle at O are a , b , and α , revolves uniformly about O , so that OA makes the angle nt with the axis of x , and carries a circle of which AB is the diameter. Prove that a point moving in the circumference of the carried circle with twice the angular velocity of the triangle will describe an ellipse whose axes are

$$\sqrt{(a^2 + b^2 + 2ab \cos \alpha)} \pm \sqrt{(a^2 + b^2 - 2ab \cos \alpha)}.$$

NOTES.

Dr. O. L. Underhill has been appointed instructor in mathematics at Princeton University.

Mr. A. D. Pitcher has been appointed fellow in mathematics at the University of Kansas.

Mr. D. A. Lehman has been appointed instructor in mathematics at the University of Wisconsin.

Mr. R. F. Sharpe, assistant in mathematics at Cornell University, is Second Wrangler in mathematics at Cambridge, England.

Dr. Oswald Veblen and Dr. J. W. Young have been appointed to assistant professorships in mathematics at Princeton University.

Dr. O. D. Kellogg, of Princeton University, has been appointed assistant professor of mathematics at the University of Missouri.

Mr. R. L. Borger, of the University of Florida, has been appointed instructor in mathematics at the University of Missouri.

The assistants in mathematics at Cornell University for 1905-1906 are F. C. Edminster, R. F. Sharpe, E. C. Colpitts, W. M. Carruth.

The following have been appointed fellows in mathematics at The University of Chicago: George D. Birkhoff, Louis Angold, William R. Longley.

The student assistants in mathematics at the University of Kansas for the year 1905-1906 are Mr. U. G. Mitchell, Miss Birdie Greenough, Miss Frances Lahmir and Miss Mabel Davis.

At the University of Kansas, Dr. H. B. Newson has been promoted from an associate professorship to a full professorship in mathematics, and Mr. J. A. G. Shirk has been appointed instructor in mathematics.

Mr. P. P. Boyd has been appointed Erastus Brooks Fellow in Mathematics, and Mr. C. F. Craig University Scholar in mathematics at Cornell University. The Oliver Scholarship was not awarded this year.

Miss Sarah Elizabeth Cronin, M. S., lately fellow in mathematics in the State University of Iowa, has been appointed instructor in mathematics in the Iowa State College of Agriculture and Mechanic Arts at Ames.

At the Northwestern University, Professor Thomas F. Holgate has been appointed to the Noyes Professorship of Mathematics, Dr. D. R. Curtiss has been appointed assistant professor of mathematics, and Dr. J. C. Morehead has been appointed instructor in mathematics.

Dr. J. V. Westfall and Mr. W. E. Beck have resigned their positions in the department of mathematics in the State University of Iowa; the former to accept an actuarial position with the firm of Haskins & Sells of New York City, the latter in response to a call to service in the United States Coast and Geodetic Survey. The positions thus made vacant have been filled by the appointment of Mr. R. P. Baker and Mr. C. M. Thorne as instructors.

We learn from *Science* that twenty doctorates in mathematics were conferred by American universities in the year 1905. This is an increase of seven over the year 1904. Following are the names, the institution conferring the degree, and title of the thesis in each case:

Clark University. Reginald Bryant Allen, "On Hypercomplex Number Systems Belonging to an Arbitrary Domain of Rationality;" Charles E. Browne, "A Study of the Simpler Arithmetic Processes;" John Shaw French, "On the Theory of the Pertingents to a Plane Curve;" Jesse N. Gates, "Cubic and Quar-

tic Surfaces in Fourfold Space;" Herbert G. Keppel, "The Cubic Three-Spread Ruled with Planes in Four-fold Space."

The University of Chicago. Herbert Edwin Jordan, "Group Characters of Various Types of Linear Groups;" Thomas E. McKinney, "Concerning a Certain Type of Continued Fractions Depending upon a Variable Parameter;" Robert L. Moore, "Sets of Metrical Hypotheses of Geometry;" Arthur Whipple Smith, "The Symbolic Treatment of Differential Geometry."

The University of Pennsylvania. Oliver Edmunds Glenn, "The Determination of the Abstract Groups of Order p^2qr ; p , q , and r being Distinct Primes;" Ulysses Sherman Hanna, "The Bitangentials of the Plane Quintic and Plane Sextic;" Alice Madeleine McKelden, "Groups of Order 2^m that Contain Cyclic Subgroups of Order 2^{m-1} , 2^{m-2} , and 2^{m-3} ."

Johns Hopkins University. Henry Bayard Phillips, "Some Invariants and Covariants of Ternary Collineations;" Roswell P. Stephens, I. "On a Curve of the Fifth Class," II. "On a System of Parastroids."

Yale University. Raymond B. McClenon, "On Simple Integrals with Variable Limits;" James Caddall Morehead, "Numbers of the Form $2q=1$ and Fermats Numbers."

Harvard University. Walter Burton Ford, "On a Problem of Analytic Extension as Applied to Functions Defined by Power Series."

Princeton University. Adam M. Hildebeitel, "The Problem of Two Fixed Centers and Certain of its Generalizations."

Leland Stanford University. William A. Manning, "Studies on the Class of Primitive Substitution Groups."

Cornell University. Oscar P. Akers, "On the Congruence of Axes in a Bundle of Linear Complexes."

BOOKS AND PERIODICALS.

The Continuum as a Type of Order: An Exposition of the Modern Theory. With an Appendix on the Transfinite Numbers. By E. V. Huntington. Reprinted from the *Annals of Mathematics*, (2), Vol. 6, pp. 151-184, and Vol. 7, pp. 15-43. Price, \$0.50. The Publication Office of Harvard University.

This reprint gives in 63 pages a systematic elementary exposition of the Dedekind-Cantor theory. The definitions and concepts are presented with great care; numerous simple examples are given to illustrate the systems which have, and those which have not, the property considered. The author is to be congratulated on his success in presenting this important subject in such an attractive and readable form. D.

An Elementary Treatise on Graphs. By George A. Gibson, M. A., F. R. S. E. The MacMillan Co. Price, 3s, 6d.

Mr. Gibson's book deals with this branch of mathematical science in a manner at once thorough, connected, and attractive. The earlier portions are presented in a form